AMENDMENTS TO THE CLAIMS

Claim 1 (Currently Amended): A method for providing a hydrogen separation membrane ~~6upon~~ upon a substrate, comprising;

providing [[a]] the substrate having at least one surface; ~~and~~

subjecting said at least one surface to at least one surface treatment comprising a polishing step whereby the at least one surface is smoothed and whereby bulk properties of the substrate remain unchanged;

disposing upon said at least one surface a composition; and

forming a ~~leak-tight~~ coating on said at least one surface of the substrate by a laser direct-write process utilizing said composition, wherein said ~~leak-tight~~ coating provides permeance of hydrogen therethrough, thereby forming said hydrogen separation membrane ~~6upon~~ upon said substrate;

wherein said composition is a metallic ink having a metallic component and a carrier component, said metallic component comprising at least at least one of palladium, a palladium alloy, and a palladium and silver alloy.

Claim 2 (Cancelled).

Claim 3 (Currently Amended): The method of claim 1, wherein said composition providing said ~~leak-tight~~ coating is comprised of at least one of palladium or palladium alloy.

Claim 4 (Original): The method of claim 1, wherein said substrate is a porous substrate.

Claim 5 (Cancelled).

Claim 6 (Cancelled).

Claim 7 (Cancelled).

Claim 8 (Currently Amended): The method of claim [[5]] 1, further comprising the step of providing a diffusion barrier upon said at least one surface after subjecting said at least one surface to said surface treatment.

Claim 9 (Original): The method of claim 8, further comprising the step of etching said provided diffusion barrier prior to disposing said composition upon said at least one surface.

Claim 10 (Original): The method of claim 6, wherein said polishing step utilizes a method selected from the group consisting of shot peening, ion-beam treatment, plasma deposition of metals and vapor deposition of metals.

Claim 11 (Original): The method of claim [[3]] 4, wherein said porous substrate is a porous metallic substrate.

Claim 12 (Original): The method of claim 9, wherein said etching step employs etching with at least one of nitric acid, hydrochloric acid and pickling solutions.

Claim 13 (Currently Amended): The method of claim 1, further comprising ~~the step of~~ subjecting said ~~leak-tight~~ coating to thermal processing.

Claim 14 (Currently Amended): The method of claim 13, wherein ~~said steps of disposing, forming~~ the disposing upon said at least one surface the composition, the forming the coating, and ~~thermally processing~~ the thermal processing are successively repeated providing a plurality of layers of said [[leak-tight-]] coating, whereby said hydrogen separation membrane includes said plurality of layers.

Claim 15 (Original): The method of claim 13 or 14, wherein said thermal processing includes at least one of sintering and bake out of organics.

Claim 16 (Currently Amended): The method of claim 1, wherein said ~~leak-tight~~ coating providing said hydrogen separation membrane, disposed upon said substrate, is less than about 20 microns thick.

Claim 17 (Currently Amended): The method of claim 1, wherein said ~~leak-tight~~ coating providing said hydrogen separation membrane, disposed upon said substrate, is about 2 to about 10 microns thick.

Claim 18 (Currently Amended): The method of claim 1, wherein said ~~leak-tight~~ coating providing said hydrogen separation membrane, disposed upon said substrate, is about 5 to about 10 microns thick.

Claim 19 (Cancelled).

Claim 20 (Cancelled).

Claim 21 (Currently Amended): The method of claim ~~19~~ 1, wherein said metallic component of said metallic ink is produced by an aerosol decomposition process.

Claim 22 (Currently Amended): The method of claim ~~20~~ 1, wherein said metallic component has a palladium content of about 70 to about 78% by weight.

Claim 23 (Currently Amended): The method of claim ~~20~~ 1, wherein said metallic component has a palladium content of about 75 to 77% by weight.

Claim 24 (Cancelled).

Claim 25 (Currently Amended): The method of claim ~~24~~ 1, wherein said metallic component of said metallic ink comprises about 25% palladium and silver mix and about 75% carrier, by weight respectively, wherein said palladium and silver mix is provided in a ratio of about 75% palladium to about 25% silver, by weight respectively.

Claim 26 (Currently Amended): The method of claim ~~24~~ 1, wherein said metallic component of said metallic ink comprises about 5% to 50% palladium and silver mix and about 50% to 95% carrier, by weight respectively, wherein said palladium and silver mix is provided in a ratio of about 70% to 78% palladium to about 22% to 30% silver, by weight respectively.

Claim 27 (Original): The method of claim 15, wherein said thermal processing is carried out in an atmosphere having low partial pressure of oxygen.

Claim 28 (Currently Amended): The method of claim 15, wherein said thermal processing is carried out in a lean hydrogen gas atmosphere having less than about 10% hydrogen by weight.

Claim 29 (Currently Amended): A hydrogen separation membrane ~~reformer~~ comprising:

a ~~thin leak-tight~~ coating disposed upon a substrate~~,~~;

wherein said ~~leak-tight~~ coating transports hydrogen ~~and said thin leak-tight coating is comprised of at least one of palladium, palladium alloys or palladium and silver alloy;~~

wherein the substrate is of a porous metal, a surface thereof being polished by a surface treatment whereby the at least one surface is smoothed and whereby bulk properties of the substrate remain unchanged;

wherein said coating is provided to said substrate by a laser direct-write process utilizing a metallic ink having a metallic component and a carrier component, said metallic component comprising at least at least one of palladium, a palladium alloy, and a palladium and silver alloy.

Claim 30 (Currently Amended): The ~~reformer~~ hydrogen separation membrane of claim 29, wherein said ~~thin leak-tight~~ coating is formed on a porous substrate.

Claim 31 (Currently Amended): The ~~reformer~~ hydrogen separation membrane of claim 30, wherein said substrate is a porous metal ~~substrates~~ substrate.

Claim 32 (Cancelled).

Claim 33 (Currently Amended): The ~~reformer~~ hydrogen separation membrane of claim ~~32~~ 29, wherein said polished substrate is treated to include a diffusion barrier between said polished substrate and said ~~leak-tight~~ coating.

Claim 34 (Currently Amended): The ~~reformer~~ hydrogen separation membrane of claim 33, wherein said diffusion barrier is etched.

Claim 35 (Currently Amended): The ~~reformer~~ hydrogen separation membrane of claim ~~32~~ 29, wherein said polishing is accomplished by at least one of shot peening, ion-beam treatment, plasma deposition of metals and vapor deposition of metals.

Claim 36 (Cancelled).

Claim 37 (Currently Amended): The ~~reformer~~ hydrogen separation membrane of claim 29, wherein said ~~thin leak-tight~~ coating has a thickness of less than about 20 microns.

Claim 38 (Currently Amended): The ~~reformer~~ hydrogen separation membrane of claim 29, wherein said ~~thin leak-tight~~ coating has a thickness of between about 2 to 10 microns.

Claim 39 (Cancelled).

Claim 40 (Currently Amended): The ~~reformer~~ hydrogen separation membrane of claim 39, wherein said metallic component of said metallic ink is provided by an aerosol decomposition process.

Claim 41 (Currently Amended): The ~~reformer~~ hydrogen separation membrane of claim 39, wherein said metallic component of said ink is comprised of an alloy having between about 70 to about 78% palladium by weight.

Claim 42 (Currently Amended): The ~~reformer~~ hydrogen separation membrane of claim 39, wherein said metallic component of said ink is comprised of an alloy having between about 75 to about 77% palladium by weight.

Claim 43 (Cancelled).

Claim 44 (Cancelled).

Claim 45 (Currently Amended): The ~~reformer~~ hydrogen separation membrane of claim 44, wherein said metallic component of said metallic ink is comprised of about 25% palladium and

silver mix and about 75% carrier, by weight respectively, wherein said palladium and silver mix is provided in a ratio of about 75% palladium to about 25% silver, by weight respectively.

Claim 46 (Currently Amended): The ~~reformer~~ hydrogen separation membrane of claim 44, wherein said metallic component of said metallic ink is comprised of about 50% palladium and silver mix and about 50% carrier, by weight respectively, wherein said palladium and silver mix is provided in a ratio of about 70% palladium to about 30% silver, by weight respectively.

Claim 47 (Original): The method of claim 13 or 14, wherein said thermal processing includes at least one of organics bake out and localized sintering of the coating and not an underlying support, wherein said localized sintering of the coating utilizes an ion or laser beam.

Claim 48 (Currently Amended): The method of claim [[2]] 1, wherein said substrate is cylindrical or tubular.

Claim 49 (Currently Amended): The ~~reformer~~ hydrogen separation membrane of claim ~~36~~ 29, ~~wherein said reformer~~ wherein said substrate is cylindrical or tubular.